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UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

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GULLIVER SWEEPING AWAY AN ARMY OF LILLIPUTIANS

Few people appreciate the tremendous power exerted by running water, how it carves gullies in a single rain, how it can strip off inches of topsoil with the ease of a Gulliver sweeping away an army of Lilliputians.

Preparedness against soil erosion is necessary if agriculture is to maintain its productivity. When the enemy is at the gates there is little that can be done. Defenses must be installed before Nature opens up with her heavy artillery.

After a heavy flash rain, evidences of erosion are plainly visible even to the casual observer who gives a passing glance to a sloping, clean-cultivated, unprotected field. Rills, and sometimes gullies, can be seen where the soil has been scooped out by run-off waters.

Of course, this year's rainfall in southern California is approximately double that of last year and consequently soil losses have been greater than usual where defenses against erosion have not been installed. Due to the fact that some of the rains followed one another so closely, the loss of soil was greater than it would have been had the rains been spaced so that saturated soils would have had a chance to dry out.

Control measures being used on demonstration areas of the Service in California to cope with conditions as described, include cover cropping, contour sub-soiling, annual ditches, and permanent cover. Cover crops protect the soil from the direct impact of the rain and favor greater moisture penetration. Annual ditches break up the concentration of run-off waters down the slope. Contour sub-soiling makes for deeper penetration of rainfall. Planting of highly erosive hillsides to soil-holding trees, shrubs, or grasses, protects lower lying lands from mud-laden run-off waters.

Eternal vigilance is necessary to protect the soil from erosion. "Gully washing" rains are a continuing threat to unprotected hillside farms.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the transparency and accountability of the organization. This section also outlines the various methods used to collect and analyze data, ensuring that the information is reliable and up-to-date.

2. The second part of the document focuses on the financial aspects of the organization. It provides a detailed overview of the budget, including the projected income and expenses for the upcoming year. This section also discusses the various financial risks and how they are being managed to ensure the organization's financial stability.

3. The third part of the document addresses the operational aspects of the organization. It describes the various processes and procedures that are in place to ensure the efficient and effective delivery of services. This section also discusses the various challenges that the organization is facing and the strategies being implemented to address them.

4. The fourth part of the document discusses the human resources of the organization. It provides a detailed overview of the current staff levels and the various roles and responsibilities of the different departments. This section also discusses the various training and development programs that are in place to ensure that the staff is equipped with the necessary skills and knowledge to perform their duties effectively.

5. The fifth part of the document discusses the legal and regulatory aspects of the organization. It provides a detailed overview of the various laws and regulations that the organization is subject to and the steps being taken to ensure compliance. This section also discusses the various legal risks and how they are being managed to ensure the organization's legal integrity.

6. The sixth part of the document discusses the environmental and social aspects of the organization. It provides a detailed overview of the various environmental and social issues that the organization is facing and the steps being taken to address them. This section also discusses the various sustainability initiatives that are in place to ensure that the organization is operating in a socially and environmentally responsible manner.

7. The seventh part of the document discusses the future of the organization. It provides a detailed overview of the various strategic initiatives that are being implemented to ensure the organization's long-term success. This section also discusses the various challenges that the organization is facing and the strategies being implemented to address them.

8. The eighth part of the document discusses the conclusion of the document. It summarizes the key findings of the various sections and provides a final overview of the organization's current state and future prospects. This section also discusses the various recommendations that are being made to ensure the organization's continued success.

RANCHERS IN NEVADA AIDED IN RESCUING SNOW-BOUND STOCK

The blanket of cold air that settled down upon the state of Nevada in January and February will, undoubtedly, mark the winter of 1937 as one to go down in history as one of the most severe winters ever experienced. Numerous snow storms, and enough sub-zero weather to please an Arctic explorer, caused suffering among human and animal life. The Soil Conservation Service and the Panaca and Bunkerville CCC Camps were called upon to rescue snow-bound parties and stock.

Trails Broken Through Snow

Trails were broken through deep snow and feed hauled to starving sheep and cattle. During the month of February 103 man-days of CCC labor were used in rescue work. Over 300 miles of trails were broken. It is estimated that 2,000 head of cattle and 100,000 head of sheep have been succored thru the assistance of the Service and the two CCC Camps since the first of January.

Stockmen Appreciate Help

Appreciation for the help given in this emergency has been expressed by stockmen thru their organizations. Typical of the letters received is the following from the Lincoln County Farm Bureau to Wyatt Harmon, Nevada Project Manager: "The Lincoln County Farm Bureau wishes to express its appreciation for the excellent work done by the Soil Conservation Service during the recent storms and cold weather. Livestockmen feel that with the service rendered by the Soil Conservation Service in clearing the roads, hauling feed to the stock and furnishing men and equipment for the benefit of the livestock industry, the losses sustained were cut to a minimum....."

Two Miners Rescued

Among reports made during the emergency the following is representative: "Another appeal for a tractor to break trail to the Baker sheep in the Sand Springs country, fifty miles west of Crystal Springs. Sanford again volunteered and I authorized the use of the tractor when Mr. Baker offered to pay the wages of the workmen and the cost of gas, fuel, and oil to be consumed in our efforts. ...enroute to the Sand Springs country, Sanford and crew came upon two miners who had been camped in the snow two weeks and who had been subsisting on flour and jack rabbits. Both men were frost bitten in a number of places and were in dire circumstances when rescued. Most of Baker's sheep were saved."

INTENSE RAINS BRING OUT VALUE OF CONTROLLING RUN-OFF
TO SAVE SOIL AND WATER

- by -

Paul B. Dickey, Associate Regional Agronomist

Above-normal rains of the past winter have brought out the necessity of having complete erosion controls on sloping fields if soil loss is to be prevented. It is not possible to attribute the conservation of soil and moisture to any one protective measure. In practically all cases observed it was found that several factors, often many factors, contributed to complete soil protection during heavy flash rains. When the proper conservation elements are combined, the high degree of protection from washing is conspicuous, in contrast with fields upon which erosion is uncontrolled or only partially controlled.

Level Basin
Terraces

In one instance large, level, basin-terraces were built on 1.55 acres of Arnold loam and sandy loam soil on a 20 to 25 percent slope. The soil in this location is moderately permeable, and the substrata or C-horizon is more or less pervious, there being no tendency for the soil to slip even when the surface and subsoil is saturated. Cross checks were built about 15 feet apart dividing the terrace channels into large basins. These basins have capacity to hold all the water that falls on the treated part of the slope, water that would otherwise have accumulated and washed gullies in the field below, had the basins not been built.

Water stored
In Soil

Water caught in these basins last year was stored in the soil, and trees and shrubs planted in the basins and on the berms have grown rapidly. The very high percent of survival and the rapid growth of these trees can be attributed to careful planting and an increased moisture supply.

These level basin-terraces constitute a particularly successful erosion prevention measure when built in permeable or moderately permeable soil. Such treatment of hilltops and knolls will eliminate the heavy run-off which does so much damage to fields below, but it must be emphasized that the soil characteristics will determine where this erosion control element may be successful. On suitable soils on slopes up to 30 percent, the moisture conserving basin-terraces can be built at a moderate cost per acre.

Soil can be protected from washing if the accumulation and movement of surface water is controlled. Deep tillage practices and the incorporation of organic matter are very effective in increasing the rate of moisture penetration. Increase in the rate of deeper percolation prevents accumulation of water on the surface.

Terracing Combined With Sub-soiling

Terracing combined with sub-soiling has proven effective in conserving soil and moisture. As an example of this practice, a field including Arnold loam and Laguna loamy sand, was terraced and subsequently contour sub-soiled to a depth of approximately 15 inches. The slope on this field ranges from 25 percent at the upper side to 3 percent at the lower side. Previous to sub-soiling and terracing, accumulated water from this field, and the area above, washed numerous gullies. Deep sub-soiling broke up a plow pan formed by previous cultivation and permitted rainwater, as it fell on the surface, to rapidly reach the sub-soil horizon and penetrate to greater depths. Absorption of precipitation thus took place in the second and third foot depths of soil almost as soon as in the first foot.

Vegetative Cover

On the field mentioned above a ground cover of wild lettuce and other weeds were allowed to grow and though the weeds did not constitute a 100 percent cover, they aided very effectively in protecting the soil from washing.

Puddling of Surface Soil

The force of raindrops is broken by vegetative cover, thus preventing the disturbance and puddling of the surface soil. If not prevented, this rearrangement tends to seal over the interstices between the soil particles and markedly reduces the rate of moisture penetration through the surface inch of soil. Except during very gentle rainstorms the rate of precipitation exceeds the rate at which moisture penetrates the soil. In cases of higher rates of precipitation any reduction in the rate at which rainwater enters the soil normally results in an approximately equal increase in the rate of water accumulation on the surface. This accumulation becomes "run-off" and on slopes is the dangerous force causing erosion.

The roots of plants aid indirectly in accelerating moisture penetration. The presence of plants fosters increased activity of insects and worms in the surface soil and their holes are a factor favorably affecting the rate at which water

penetrates the soil. In the course of seed bed preparation the protective vegetative ground cover is incorporated into the soil, and as organic matter tends to maintain the structure and tilth of the cultivated soil layer. In a subsequent rainy season the previous year's vegetative matter, when incorporated with the surface soil, provides small channels and pores by which water can more readily enter the soil.

Basin Furrows

On another field, on a slope varying from 15 to 40 percent, the native vegetation had just been burned off. This field, of Arnold gravelly sandy loam was contour furrowed, the furrows spaced about 3 to 5 feet apart. The furrows average about 10 inches wide and 6 inches deep and were blocked with small dams about 5 feet apart. In southern California generally, the expected result following a fire is a damaging flood of water and silt after a heavy rainstorm. On this field following and during a rainfall of nearly 4 inches in one day, only a small stream of water ran in the gully draining the 22.5 acres, but water has continued to flow in this gully as a trickle since the first heavy rain. In fact, water has been present in this channel continuously for over eight weeks. In this instance the rainwater was absorbed by the soil, with help of the contour furrows, and as the soil became saturated above a deep impervious layer some of the water found its way to the surface at the bottom of the slope and ran out of "springy" places. In regions of limited rainfall it is easy to understand the benefit of this extra moisture to either crop plants or the native vegetative cover.

Under certain conditions moisture conservation practices will tend to produce slides which may carry grass, shrubs, and even trees down the hill. This fact again emphasizes the necessity of knowing the character of the soil material and the geologic formation underlying the soil to be treated, as a basis for selecting the appropriate moisture conservation or erosion control element.

Basin Listing

Basin listing is a moisture conserving practice which, by holding the rainwater on the land, reduces erosion and water losses. Although this practice is limited to the leaser slopes (3 to 10 percent in most cases) it is adapted to a wide variety of soils, especially those of deep, permeable character. On the less permeable soils, water from one rain may stand in the basins until the next rain. The capacity of

the basins may not be sufficient under such conditions, over-topping and gullying resulting. Deep tillage, fertilizing, green manuring and other practices which increase the rate of moisture absorption by the soil will largely overcome the danger of water standing too long in the basins.

Moisture Penetration
Through Fertilized
and Unfertilized
Soils

Observations on two adjacent properties serve to emphasize this point. Each of two fields have lost about 5 percent of the surface soil, both are planted to walnuts and both were disked prior to being basin-listed on the contour. The soil is Sorrento clay loam and the slope is very gentle in both cases. On one field the land has been fertilized, beanstraw has been spread and green manure crops grown and turned under. The other field has been clean-cultivated and not fertilized. The basins on the fertilized field accumulated water to 40 percent (percent figures are estimates) of their capacity and after 48 hours only about 1 percent of the basins had water in them. On the unfertilized field water accumulated in the basins to 95 percent of their capacity and was still standing in 75 percent of the basins after 48 hours. The moisture penetrated 50 percent farther in the fertilized field than in the unfertilized field.

Yields Affected
By Erosion Control

It has been shown¹ that the larger the crop the greater is the amount of moisture used in its production and that under dry-farming, the larger crops will draw upon the moisture in the soil to greater depths. Conversely then, it may be expected that crop yields may be somewhat increased on land protected by erosion control measures which increase the depth to which water is stored at field capacity. If, as a result of moisture conservation practices, the soil is wetted to field capacity to a greater depth than formerly, there will be more water stored in the soil for the use of plants. Soil and moisture conservation, therefore, is profitable to both the present and the future farmers.

¹Conrad, John P. The effects of variations in the yields of barley upon the amount and distribution of the residual soil moisture. Journal of American Society of Agronomy 29:145-52 February 1937.

SECOND NORTH AMERICAN WILDLIFE CONFERENCE

- by -

Floyd H. Wymore, Regional Biologist

When white men first arrived on the North American continent, game and wildlife were so plentiful that their exhaustion was never thought of. Thousands of buffalo ranged the Great Plains, wild turkeys strutted through woodland glades, clear rivers and streams teemed with fish, and quail, deer, and fur-bearing animals abounded.

Depletion of
Wildlife Resources

With the westward movement of population, conditions changed. Buffalo were slaughtered for their hides or tongues, clear streams were contaminated with waste from cities and industries, game birds were ruthlessly killed for markets and restaurants, and a veritable debauch of our wildlife resources went on apace.

In recent years various individuals, governmental agencies, and private organizations have brought to the attention of the public a realization of the urgent need to do something about our waning wildlife resources.

Wildlife
Conference

This month the eyes of conservation-minded citizens were focused on the Second North American Wildlife Conference, sponsored by the American Wildlife Institute, which met in St. Louis, March 1-4. Six hundred delegates, including representatives from Canada and Mexico, and from all sections of the United States, met there to discuss a program to conserve wildlife.

These delegates represented conservation groups with an estimated membership of 3,000,000. They voted unanimously for a permanent organization to be known as "The General Wildlife Federation". This organization bands together 36,000 North American conservation clubs and societies and should lead to a more forceful conservation program.

Jay N. "Ding" Darling, noted as one of the nation's leading conservationists, cartoonist, and former head of the Federal Biological Survey, was elected president by acclamation.

Wildlife
Restoration

Henry A. Wallace, Secretary of Agriculture, in an address to the delegates declared that the problem of wildlife restoration is a part of the general problem of land utilization.

He said, "As I see it, the problem of wildlife restoration is fundamentally one of land utilization, a matter to which we have just begun to give effective consideration in the past ten years. As a result of our slowness in tackling this fundamental problem, we are now confronted with the social-economic problem of a half-million families occupying land incapable of sustaining human beings, but quite capable of supporting an abundance of valuable lesser forms of life, birds, animals, and fishes. We find other thousands of tenant farm families moving hopelessly through vicissitudes of misery, becoming progressively more destitute in their wanderings, and leaving behind them a progressive impoverishment of soil fertility."

Need for Soil Conservation

Referring to loss of soil from wind and water erosion, Secretary Wallace said: "No country on earth can endure such frightful losses indefinitely." He added that means of avoiding such losses through the planting of trees and grass and other conservation measures have been advocated by groups such as he was addressing.

A considerable portion of the business of the conference was devoted to technical developments. It was reported that within the past year, the American Wildlife Institute has established professorships of conservation and game management in nine land-grant colleges.

Erosion Control Aids Fishing

Earnest G. Holt, head of the section of Wildlife management of the Soil Conservation Service, told how erosion control measures are aiding in the improvement of fishing through keeping streams clear of silt that previously washed down from unprotected hillsides.

He also stated that when wise land-use supplants the present exploitation and neglect, the balance of nature may be restored. Abundance of wildlife is a natural by-product of effective conservation practices. Wherever erosion is checked by restoration of trees, shrubs and other vegetation, the presence of cover and food makes possible the return of game species.

* * *

GRASSES FOR ERODED LANDS

- by -

W. H. von Trebra, Project Agronomist

With the beginning of the Soil Conservation program in California, seeds of grasses, legumes, and other plants were purchased, and where possible, native seeds were gathered. These seeds were planted at once in order to acquire information that would assist the vegetative control phases of the program.

Test Plots

All available sources of information were consulted as to the most desirable seeds for the purpose of seeding areas taken out of cultivation. These areas in most cases were severely eroded, low in fertility, and subject to our usual eight months drought. Experience under such conditions has been limited. Small test plots were therefore established in southern coastal areas early in 1935 and 1936 to determine relative drought-resistance.

Harding Grass Shows Promise

In the commercial seed group, Harding grass, Crested wheat, and Smooth Brome have all survived. Of this group Harding grass has shown the most promise in that it has developed the largest root system and produced considerable forage.

On soil of medium to good fertility, Western Rye grass when seeded early has grown rapidly, but has acted in most cases as an annual, requiring re-seeding by hand until natural reseedling could be depended on.

Sudan for Summer Pasture

Sudan grass, an annual, was included in the test, but it is not adapted to extremely dry eroded sites. However, on earth fills, if moisture is available when seeding is done in April, it will produce an excellent cover. Sudan is also a very satisfactory summer pasture crop if seeded on good soil having plenty available moisture.

Other commercial and native types were included in the tests but too little is known about their local adaptations at present to report their probable use in erosion control and forage.

Native Plants

General observations indicate that for the present the native species of wild oats, bur clover, and alfalfa should be used in most cases to provide

a cover for the prevention of erosion and furnishing forage for livestock until other plants have proven to be more efficient.

New Plantings

A number of new grasses, legumes, and miscellaneous plants have been planted for observational purposes. Within another year it is hoped to have more definite information on new plants suitable for the control of erosion and forage for livestock.

* * *

FLAX IN THE LAS POSAS PROJECT

Flax of the variety Punjab CI 20 was planted on some 50 acres in the Las Posas demonstration area in Ventura County during November and December 1936.

Location of Plantings

All plantings were made under supervision of the Soil Conservation Service in cooperation with the County Farm Advisor and farm operators in the area. Individuals desiring to follow the progress of this crop should visit several of these fields. Locations of fairly accessible plantings are:

<u>Property</u>	<u>Operator or Tenant</u>	<u>Location</u>
W. R. Livingston	Same	La Loma Avenue
Security 1st Nat'l		Cor. of Beryl-
Bank	Tom Gill	wood & Bradley
		Rds.
Anna B. Ford	D. Genevisio	Berylwood &
		Aggen Roads
B. I. Company	J. Smith	Donlon Road

Seed Buds

At present vigorous and good to excellent stands are to be seen on fields drill planted. In most of these fields, plants average from 16 to 18 inches in height. Seed buds are being produced in profusion. Several of the earliest areas planted are in partial bloom.

* * *

SUDAN GRASS

Small plantings of Sudan grass were seeded the early part of the summer of 1936 by Frank Ormonde in the Arroyo Grande demonstration area, and by Michael Kolding in the Lompoc Area, for summer pasture. Both cooperators were well satisfied with the results and are planning on seeding a larger acreage this season.

